Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences
Quebec Region
Canadian Science Advisory Secretariat
Science Response 2012/012

HARVEST SCENARIOS FOR ATLANTIC MACKEREL (*SCOMBER SCOMBRUS* L.) FOR THE 2012 AND 2013 FISHING SEASONS

Context

Atlantic Mackerel in NAFO subareas 3 and 4 were assessed on April 18, 2012 at Mont-Joli in order to provide a scientificadvice for the 2012 and 2013 fishing seasons. After this meeting, highlights of the assessment were presented on April 24 during a conference call with fishery managers. During this call, Fisheries and Aquaculture Management requested that new scenarios regarding fishing mortality be examined in order to help the Department in setting TACs and in assessing the impact on spawning biomass. These scenarios are: (1) 2011 fishing mortality, (2) 2011 fishing mortality – 25%, and (3) 2011 fishing mortality + 50%.

Given the short time frame (advice due on May 1, 2012), a *Science Special Response Process* (SSRP) was used to present the results of the three scenarios. This Science response comes from the April 30, 2012 meeting on the assessment of Atlantic Mackerel harvest scenarios for the 2012 and 2013 fishing seasons.

Catch projections for 2012 and 2013 based on the 2011 fishing mortality or at a higher level would result in decreases in the spawning biomass. A reduction of at least 15% of it would be associated with a 50% increase ofthe 2011 fishing mortality.

Analysis and Responses

Methodology

Catches were projected over two years (2012 and 2013) from the abundances at age (1 to 10^{+}) estimated at the beginning of 2012 using the Sequential Population Analysis (SPA) that was used as the basis of the scientificadvice (2012/023). Catches (N_{ct}) were projected using Baranov's equation (Haddon 2011), which is defined as follows:

$$N_{ct}=\left(\frac{F_i}{F_i+M}\right)N_t\left(1-e^{-(M+F_i)}\right)$$

whereF_i(average of ages 3 to 5 weighted by the corresponding abundances) and M are the instantaneous rates of fishing and natural (0.20) mortalities, respectively and N_t is the abundance at the beginning of the year. The use of Baranov's equation implies that the instantaneous rates of fishing and natural mortalities are constant throughout the year and that their action on the population is simultaneous (type II fishery; Ricker 1980). Projected catches were converted into tonnes by using the 2010 and 2011 mean weight at age (mid-year).

Abundances (N_{t+1}) at the beginning of 2013 and 2014 were projected using the following equation:

$$N_{(t+1)} = N_t - N_t\left(1-e^{-(M+F_i)}\right)$$

These abundances were converted into spawning biomasses (t) by using the 2010 and 2011 mean weights at age (January 1st) and mean proportions of maturity at age. Note that the abundances at age 1 at the beginning of 2013 and 2014 correspond to the 2010 and 2011 mean recruit abundance at the same age.

Results

Projections made using the fishing mortality measured in 2011 by the SPA (0.155) would result in 2012 and 2013in catches of 10,822 and 10,338 t, respectively. A reduction of close to 3% of the spawning biomass would be associated with these catches.

Projections made with a 25% reduction of the 2011 fishing mortality would result in 2012 and 2013in catches of 8,266 and 8,185 t. An increase of close to 5% of the spawning biomass would be associated with these catches.

Lastly, projections made with a 50% increase of the 2011 fishing mortality would result in 2012 and 2013in catches of 15,655 and 13,923 t. A reduction of at least 15% in the spawning biomass would be associated with these catches.

Conclusion

Projections made with the 2011 fishing mortality or at a higher level would result in decreases in the spawning biomass. An increase in that would be associated with at least a 15% reduction of the 2011 fishing mortality. Lastly, the mean sustainable level of fishing mortality of the 1968 to 1992 period that was used in the assessment to define catches in 2012 and 2013 corresponds to a 20% decrease of the 2011 fishing mortality.

Collaborators

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Sources of Information

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